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TESTIMONY

Policy Issues for Alternative Fuels for Military Operations

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Policy Issues for Alternative Fuels for Military Operations

Before the Committee on Armed Services
Subcommittee on Readiness
and
Subcommittee on Terrorism, Unconventional Threats and Capabilities
United States House of Representatives

September 26, 2006

Chairmen and distinguished Members: Thank you for inviting me to speak on the important subject of developing and using unconventional fuels that can substitute for crude oil. I am a Senior Policy Researcher at the RAND Corporation and have over 25 years of experience analyzing and assessing energy technology and policy issues. My remarks today are based on recent and ongoing research that RAND has been conducting with support from the U.S. Departments of Energy and Defense. My views on this topic are also shaped by my experience in watching the rise and fall of the U.S. Synthetic Fuels Corporation during my public service in the U.S. Department of Energy.

Today, I will discuss alternative fuels for military transportation, the prospects and policy issues associated with developing a coal-to-liquids industry to meet military fuel needs, and approaches Congress could take to address these issues. My key conclusions are that (1) coal-to-liquids offers one important opportunity as a substitute for crude oil; (2) there are also challenges that must be overcome if a coal-to liquids industry is to be developed in the United States, (3) there are a number of actions the Federal government could take to further develop and explore this option; and (4) it would be unwise to proceed precipitously with a "crash" program of investment in coal-to-liquids at this time.

Military Fuel Options

Liquid fuels for transportation generally fall into one of two categories, the gasoline group or the distillate fuel oil group. We are all familiar with the gasoline group. These are highly volatile fuels

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that ignite easily and therefore are suitable for spark-ignition engines. Nationwide automotive demand for gasoline is about 9 million barrels per day. The distillate fuel oil group includes diesel and jet fuel, as well as home heating oil. Nationwide demand for distillate fuel oils is nearly 6 million barrels per day. A particular formulation of jet fuel known as JP-8 and its close relative JP-5 fuel nearly all the mobile weapon and combat support systems in our armed forces, be they aircraft, ships, tanks, or other vehicles. These fuels are preferred for combat operations because they have a very high energy density per unit volume and because they are less subject to accidental ignition, compared to gasoline.

Looking at resources in the United States, only two technically viable alternatives to crude oil exist for producing significant amounts of JP-8 in the near to medium term. One option is to tap abundant and rich oil shale deposits in Colorado, Utah, and Wyoming. The other option is based on a method known as Fischer-Tropsch synthesis. This method either uses coal or a combination of coal and local agricultural wastes or other types of biomass.

Beyond the co-feeding of biomass with coal, no other technically viable approaches are ready today for using renewable resources to produce significant amounts of JP-8 or similar fuels in the distillate fuel oil group. In particular, the potential for bio-diesel produced from vegetable oils is severely limited because of low oil yields per cultivated acre and because of the amount of suitable arable land available in the United States. Moreover, at the current state of technology development, there is no fermentation-type process, such as the distillation-based methods used for ethanol production, capable of producing a product that would be suitable for formulating or blending with a distillate fuel oil for transportation, including aviation. These opportunities may expand in the future with further advances in renewable energy-producing technologies.

Very promising near-term development work on oil shale is underway, but pending success in this work, oil shale remains a very expensive option for producing liquid fuels. For this reason, the remainder of my testimony will address options for coal-to-liquids fuel production.

Prospects and Policy Issues for a Commercial Coal-to-Liquids Industry

The prospects for a commercial coal-to-liquids industry in the United States remain unclear. Three major impediments block the way forward:

1. Uncertainty about the costs and performance of coal-to-liquid plants;
2. Uncertainty about the future course of world oil prices;

3. Uncertainty about whether and how greenhouse gas emissions, especially carbon dioxide emissions, might be controlled in the United States.

Given the importance of these three uncertainties, an immediate national commitment to rapidly put in place a multi-million-barrel-per-day coal-to-liquids industry would be very counterproductive. Rather, Congress should consider a more measured approach to developing a coal-to-liquids industry, similar to the approach recommended in the recent RAND study on oil shale development.[2] The focus of that measured approach would be to foster early operating experience by promoting the construction and operation of a limited number of commercial-scale plants. This approach would provide an effective way to deal with the uncertainties listed above.

Gaining early operating experience from a few coal-to-liquid plants would reduce the cost and performance uncertainties that currently impede private-sector investments. At present, the knowledge base for coal-to-liquid plant construction costs and environmental performance is very limited; it is based on engineering design work intended to guide federal R&D efforts rather than support investment decisionmaking. Early operating experience would promote post-production learning, leading to future plants with lower costs and improved performance. Post-production cost improvement—sometimes called the learning curve—plays a crucial role in the chemical process industry, and we anticipate that this effect will eventually result in a major reduction of the costs of coal-derived liquid fuels. Most important, by reducing cost and performance uncertainties and production costs, a small number of early plants could form the basis of a rapid expansion of a more economically competitive coal-to-liquids industry, depending on future developments in world oil markets.

But just as it is in the national interest to promote early production experience, it is just as important that this early experience be limited to a few plants. Each of these coal-to-liquids plants would be a major endeavor. To take advantage of economies of scale, a commercial-scale plant would likely be sized to produce at least 30,000 barrels per day of liquid products. While the costs of such a plant are highly uncertain, we estimate investment costs of at least $3 billion for a first-of-a-kind plant. Subsidizing unconventional fuel production could be very expensive, especially for the initial set of production plants. A mere $10 per barrel subsidy for a single small commercial plant producing 30,000 barrels per day would add up to a taxpayer burden of about $100 million per year.

[2] Oil shale development is addressed in a recent RAND report, *Oil Shale Development in the United States: Prospects and Policy Issues,* Santa Monica, CA: RAND MG-414-NETL, 2005.

A second reason for a measured approach to industry development is to avoid adverse economic impacts that would be associated with a dramatic increase in orders for specialized materials and equipment. Combined with losing the opportunity for post-production learning, rapid increases in the costs of such materials and equipment, plus rising costs to attract certain specialized categories of workers, would lead to increased plant capital and operating costs and a requirement for even higher federal subsidies. Such cost increases could spill over to other sectors in the U.S. economy as well.

In contemplating a significant expansion in coal-to-liquids production, we also need to be aware that a large increase in coal use may not be consistent with the need to reduce worldwide greenhouse gas emissions. Increasing coal use while also reducing greenhouse gases will require technically viable, safe, and cost-effective means for carbon capture and sequestration. An advantage of the Fischer-Tropsch approach is the relatively low additional costs required to capture carbon dioxide generated at the plant site that would otherwise enter the atmosphere. Therefore, the first few coal-to-liquids plants might be able to put that carbon dioxide to good use, such as enhancing petroleum yields in U.S. oil fields. However, until carbon sequestration on a large scale is demonstrated as technically viable, safe, and cost-effective, we must recognize the possibility that coal use for both power generation and liquid fuel production may not be a sustainable path for the United States or, for that matter, the world.

Options for Federal Action

The Federal government could take several productive measures to address the three major uncertainties—production risks, market risks, and global warming—so that industry can move forward with a limited commercial production program. A key step, as noted above, is reducing uncertainties about plant costs and performance by designing, constructing, and operating a few coal-to-liquid plants. An engineering design adequate to obtain a confident estimate of costs, to establish environmental performance, and to support federal, state, and local permitting requirements will cost roughly $30 million. The Federal government should consider cost-sharing options that would promote the development of a few site-specific designs. The information from such efforts would also provide Congress with a much stronger basis for designing broader measures to promote unconventional fuel development.

The Federal government could take a number of approaches to reduce the risk to owners of coal-to-liquids plants of a sustained drop in world crude oil prices. The challenge is to protect the taxpayer by minimizing federal expenditures, while at the same time providing appropriate incentives to motivate private investment. Purchase agreements, which basically involve a

guaranteed minimum purchase price, are one approach for mitigating financial risk that we understand is being considered by the Department of Defense. This approach can be an effective for reducing risks to plant investors. I am unable to comment on what price guarantee level best serves the public good or how price guarantees might be combined with other incentives. However, I do caution against the use of federal loan guarantees. Firms with the technical and management wherewithal to build and operate first-of-a-kind coal-to-liquids plants—and then move forward with subsequent plants—generally have access to needed financial resources. Loan guarantees can induce the participation of less capable firms, while isolating the project developer from the risks associated with cost overruns and shortfalls in plant performance. The public then ends up with the bill if the project fails.

If the Federal government is prepared to promote early production experience, then expanded federal efforts in other areas would also be needed. Most important, consideration should be given to accelerating the development and testing (including large-scale testing) of methods for long-term sequestration of carbon dioxide. This could involve using an early coal-to-liquids production plant as a source of carbon dioxide for the testing of sequestration options.

At present, federal support for research in coal-to-liquids production is minimal. A coal-to-liquids research and development program focusing on high-risk, high-payoff opportunities for cost reduction and improved environmental performance would significantly enhance the learning/cost reduction potential associated with early production experience. Such an effort would also support the training of specialized scientific and engineering talent required for long-term progress. Support for coal-to-liquids could be combined with efforts to enhance long-term research and development directed at approaches for producing distillate fuels from renewables, including low-volatility alcohols.

In closing, I commend the Committee for addressing the important topic of reducing demand for crude oil. The United States has before it many opportunities—including coal and oil shale, renewables, improved energy efficiency, and fiscal and regulatory actions—that can promote greater energy security. Coal-to-liquids can be an important part of the portfolio as the nation responds to the realities of world energy markets, the presence of growing energy demand, and the need to protect the environment.